Table 4: Growth Of US National Backbone Operators [22]	
Number Of US National Backbone Operators	**Date**
9	Summer 1996
22	May 1997
37	Fall 1997
43	1999

61. Bandwidth and equipment costs have decreased and continue to decrease. Recent experience makes it abundantly clear that capital markets are willing to make financing available to build new packet-switched capacity. Hence, access to fiber capacity will not be an impediment to sellers wishing to upgrade their networks or to new competitors wishing to enter the market.

C. Public Standards And Protocols On The Internet

62. In markets where the incumbent has a proprietary standard and an entering rival must promote an incompatible alternative standard—as in operating systems for personal computers—standards can be used to create a barrier to entry. However, in markets where all rivals use the same public standard, no such barrier exists or can be created. Rather, the use of a single standard can support unlimited numbers of rivals, as in the market for household fax and telephone appliances today.

63. The Internet is based on open and public standards and protocols which are outside the control of any one of the incumbent network operators. These are vital for

[22] Id. Boardwatch acknowledges excluding backbone providers from its directory, which otherwise would have brought the total to 47.

keeping traffic running smoothly among the extraordinary number of networks comprising the Internet and the diverse mixture of hardware employed by different providers. There is no danger that proprietary standards will emerge in the future since there are well-established mechanisms for extending Internet standards. A proposed new Internet standard "undergoes a period of development and several iterations of review by the Internet community and revision based upon experience"[23] before it is adopted as a standard and published. This whole process takes place under the auspices of the Internet Society, a non-profit body, is managed by the Internet Architecture Board and the Internet Engineering Steering Group, and conducted by the Internet Engineering Task Force. In considering changes in standards, these groups require mandatory disclosure of any proposed change before it gets considered, so no proprietary standard can be introduced.[24]

VII. Interconnection Services, NAPs And MAEs

64. Interconnection services at NAPs and MAEs are complementary to Internet transport. In a sense, the Internet backbone networks are like freeways and the NAPs are like the freeway interchanges.

65. There has been significant increase in the number of NAPs as well as expansion and renewal of pre-existing NAPs. Recently, Ameritech, MAE-East, MAE-West, MAE-Dallas and Pacific Bell upgraded to ATM facilities.[25] These facilities are scalable, more

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[23] Scott Bradner, *The Internet Standards Process*, revision 3, Network Working Group (ftp://ftp.isi.edu/in-notes/rfc2026.txt), section 1.2.

[24] "No contribution that is subject to any requirement of confidentiality or any restriction on its dissemination may be considered in any part of the Internet Standards Process, and there must be no assumption of any confidentiality obligation with respect to any such contribution." *Id*, section 10.2.

[25] See Declaration of Thomas Bechly on behalf of MCI WorldCom ("Bechly Decl.") at ¶ 12.

secure, and more efficient than earlier generation shared infrastructure.[26] Table 5 shows the capacity expansion of NAPs from 1997 to January 2000. The fourth column of Table 5 shows capacity in January 2000. It is evident that there is very significant spare capacity.[27]

Table 5: MAEs' Capacity Growth And Utilization				
	Capacity (Gbps)			Sales (Gbps)
	1997	1999	January 2000 [28]	January 2000
MAE-East	7.6	11.2	19.9	11.4
MAE-West	4.3	11.2	19.9	11.8
MAE-Dallas	N/A	7.5	7.5	2.6

VIII. Strategies That The Merged Company Might Pursue

66. Some opponents of this merger have claimed that the merger will result in a number of anti-competitive effects.[29] I discuss them sequentially. In each case, I show that market forces would defeat such strategies, and therefore they would not be pursued by the merged company in the first place. Customers, existing competitors, and new entrants could respond to the suggested anti-competitive behavior by the combined MCI WorldCom and Sprint. I find that, in the light of these responses, the proposed anti-

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[26] For example, PAIX (Palo Alto Internet Exchange) was founded in 1996. It announced its 100th customer in January 2000. It has expanded to six new US locations (Tysons Corner, Atlanta, Dallas, Los Angeles, New York, and second facility in Palo Alto), and plans international expansion. Another company that builds next generation NAP facilities is Equinix. Founded in 1998, it opened its first facility in July 1999 in Washington, D.C., and received $280 million in private financing in December 1999.

[27] See Bechly Decl. at ¶ 12.

[28] MAE-West is presently undergoing an upgrade to 19.9 Gbps of ATM capacity to be completed in April 2000. See Bechly Decl. at ¶ 12.

competitive behavior would be unprofitable and therefor would not occur. The merged firm would be tightly constrained by the willingness of many alternative sellers to provide equivalent transport services.

67. There are two main ways in which the merged company could attempt to exercise market power and harm consumers:

(i) **Price increases**. It could raise the price of network services across-the-board to all customers, including replacing peering with transit sold at a high price; alternatively, it could selectively increase price to one or few networks;

(ii) **Raising rivals' costs without changing price(s)**. It could selectively degrade the quality of interconnections with competing networks, in an effort to make their networks less attractive and divert traffic to the merged company.

In my opinion, neither of these courses of action would be profitable.

A. Raising The Price Of Transport

68. If the merged firm had market power, the simplest exercise of market power would be to raise the price of its transport services. In addition, the company might refuse to continue peering with some networks and to charge them transit fees instead. The ability of a company to de-peer profitably is equivalent to the ability of a company to increase the price of transport. De-peering does not mean cutting off a customer from the network or charging an infinite price to the customer; it does not mean refusal to deal.

69. A price increase would create profit opportunities for the merged company's rivals in the transport market. Many other Internet backbone providers ("IBPs") exist already that would remain outside the control of the merged company. Major Internet

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[29] See Hausman Decl. ¶ 48-59.

backbone providers such as GTE, Verio, PSINet, and AT&T among others, stand ready to take full advantage of the opportunity that would open up if the combined MCI WorldCom - Sprint raised its prices. And, there are many regional networks that would step in as well. Because barriers to entry in Internet transport are negligible, the attempt to raise prices is likely to also induce the entry of new transport providers. Competition for the business ceded by the merging company as a result of a price increase would be intense. Entry would stop only when the price had been depressed back to the level of cost. Without significant barriers to entry, expansion and entry are inevitable when there remains any extra profit.

70. Internet backbone providers sell transport as a bandwidth of a certain capacity that allows an ISP to connect to the whole Internet. If the merged company were to increase the prices it charges to ISPs for such capacity, ISPs would promptly switch to other backbone providers. Thus, an increase in transit price by the merged company would decrease its sales sufficiently to make such a price increase unprofitable.

71. ISP connections to multiple backbones are very common. Forty three percent of all ISP connections to backbones were sold as *additional* connections to ISPs who connected to more than one backbone. A multihoming ISP can easily and at a low cost limit the size of its purchases from an IBP that increases the price of transport. Thus, the presence of multihoming increases the firm-specific elasticity of demand of IBP transport services and creates a bigger demand response to IBP price increases. This makes it even more likely that the firm-specific demand response to a price increase will be sufficiently negative to render a contemplated price increase unprofitable.

72. If the merged company's strategy were to impose equal increases in transport costs on all customers, the response of other backbone providers and ISPs will be to reduce the traffic for which they buy transit from the merged company, and to instead reroute traffic and purchase more transit from each other. Thus, in response to a price increase by the merged company, other IBPs and ISPs reduce the traffic for which they buy transit from the merged company down to the minimum level necessary to reach ISPs that are exclusively connected to the merged company. All other IBPs and ISPs exchange all other traffic with each other bypassing the merged company.

73. Figures 2 and 3 show the typical reaction of an increase in the price of a large IBP, and illustrate why the strategy of increasing price is undesirable. Consider, for example, a situation where, prior to the price increase, four ISPs (1 to 4) purchase transit from IBP 0 which considers increasing its price. Two of these ISPs (ISP 2 and ISP 3) peer with each other. This is illustrated in Figure 2. ISP 1 and ISP 4 buy transit capacity for all their traffic to IBP 0 and the other three ISPs. ISP 2 and ISP 3 buy transit capacity for all their traffic to ISP 0, ISP 1 and ISP 4.

Figure 2: Traffic flows prior to price increase

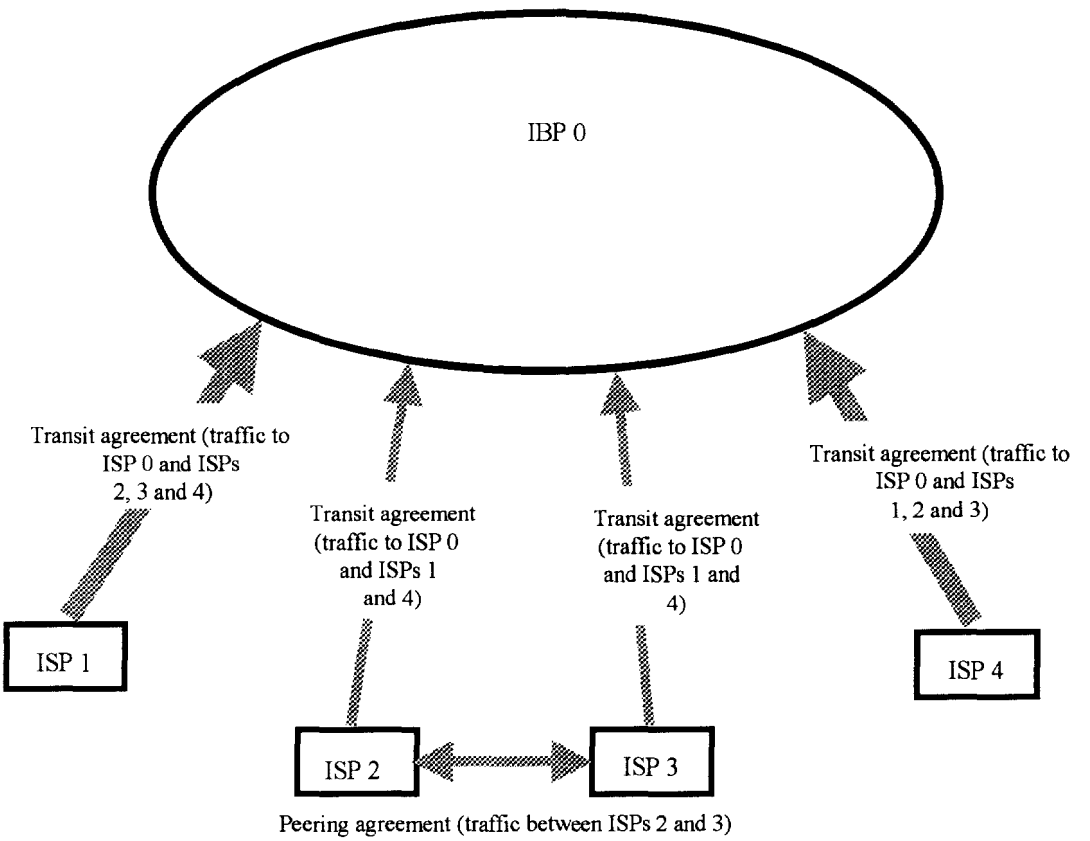
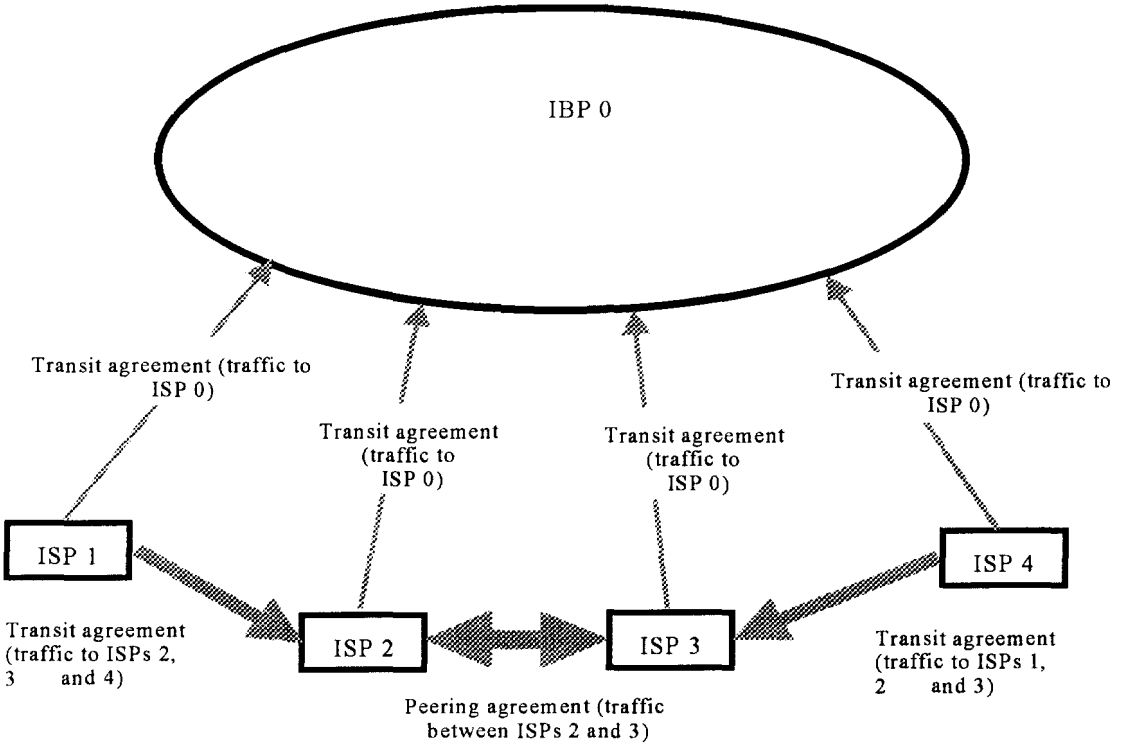


Figure 3: Traffic flows after a price increase by ISP 0



74. Now suppose that, IBP 0 increases its transit price. In response, ISP 1 and ISP 4 decide to reduce the traffic for which they buy transit from IBP 0, and instead to re-route some of their traffic and purchase more transit from ISP 2 and ISP 3 respectively. See Figure 3. Because of the peering relationship between ISP 2 and ISP 3, all traffic from ISP 1 handed to ISP 2 will reach ISP 3 as well as ISP 4 who is a customer of ISP 3. Similarly, by purchasing transit from ISP 3, ISP 4 can reach all the customers of ISP 1, ISP 2 and ISP 3. Thus, in response to the price increase of IBP 0, each of the ISPs 1, 2, 3, and 4 will reduce the amount of transit purchased from the IBP 0. Specifically, each of the ISPs buys from IBP 0 only capacity sufficient to handle traffic to the customers of network 0. This may lead to a considerable loss in revenues for IBP 0, rendering the

price increase unprofitable. The big beneficiaries of the price increase of IBP 0 are peering ISPs 2 and 3 who now start selling transit to ISPs 1 and 4 respectively and become larger networks.

75. In response to a price increase by the merged company, rivals would be able to offer their customers universal connectivity at profitable prices below the merged company's prices. In the scenario described in the example above, market forces, responding to a price increase by a large network, re-route network traffic so that it is served by rival networks except for the traffic to and from the ISPs connected exclusively with the large network. The rivals purchase the remaining share from the merged company in order to provide universal connectivity. Thus, the rivals' blended cost would permit them to profitably offer all transport at prices lower than the merged company's prices, but above cost.

76. A direct effect of the increase in price by the large network is that: (i) ISPs who were originally exclusive customers of the merged company would shift a substantial portion of their transit business to competitors; and (ii) ISPs that were not exclusive customers of the merged company would also shift a significant share of their transit business to competitors' networks, keeping the connection with the merged company only for traffic for which alternate routes do not exist or for cases of temporary failure of the rivals' networks.

B. Discriminatory Price Increases Directed Simultaneously Against All Rivals

77. Here I consider the possibility that the merged company might try to displace its rivals by charging them more than it charges ISPs who are not rivals in the transport

business. I believe that this form of price discrimination is particularly unlikely. Of all customers, rivals in the transport business—major backbones and smaller regional networks—are the best positioned to avoid the use of the merged company's network if it is more expensive than the alternatives. Even the smaller rivals are large enough that the transactions costs of establishing alternative connections are unimportant in relation to the cost increases for transport that could be avoided by making new deals.

C. Raising Rivals' Costs

78. It has been suggested that the merged company would find it profitable to raise the non-price costs of rivals by reducing the connectivity it provides with other IBPs.[30] The first observation regarding the "raising rivals' cost" or "degradation" strategy applied to clients is that as a matter of economics, it is *always* preferable to a firm to increase price rather than increase the non-price costs of rivals. A firm can choose a price increase that will have the same effect as increasing the costs (or reducing the benefits) of its clients, and it is able to collect extra revenue through the price increase while if it just degrades the product it receives no extra revenue. Prof. Hausman and other proponents of the degradation theory fail to show why it is better to degrade connectivity rather than just increase price. And, if in fact they agree with me that increasing the price is preferable to the merged company than degrading quality, there is no point in arguing any further about the undesirability of a degradation strategy, since I have already shown that a price increase strategy is unprofitable.

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[30] See id. at ¶ 53.

1. Terminating Interconnection Simultaneously With All Rivals (Refusal To Deal)

79. I first consider the extreme case in which the merged company terminates the interconnection with all rivals. This setup is equivalent to the merged company increasing the rivals' costs to infinity if they were to interconnect with MCI WorldCom - Sprint.

80. Termination by the merged network of interconnection with a network customer has a bilateral effect. It prevents the other network's customers from reaching any MCI WorldCom - Sprint customer and it prevents MCI WorldCom - Sprint customers from reaching any customers of the other network. Whatever the relative sizes of the two networks, customers of both networks are harmed. If the merged company's network has more customers than the interconnecting network, then the termination strategy will affect the merged company's network as much or more than the interconnecting network.

81. Termination of interconnection would deny MCI WorldCom - Sprint's customers the universal connectivity sought by every customer, and would have devastating effects for MCI WorldCom - Sprint. The merged company's customers—larger web sites and the ISPs specializing in end user services and web hosting—would seek new transport providers to make up for MCI WorldCom - Sprint's inability to deliver universal connectivity. The loss of business would make termination highly unprofitable.

82. This is a good demonstration of the pro-competitive effects of network externalities in the Internet. Each network, including the large network that MCI WorldCom - Sprint would operate, has a more valuable product if it interconnects with other networks. Termination of interconnection would severely lower the value of the

MCI WorldCom - Sprint service because it would shrink the connectivity the company offered.

2. Degrading Interconnection Simultaneously With All Rivals

83. Alternatively, it has been suggested that the merged company would degrade interconnection with all rivals without terminating service.[31] I believe that the suggestion that MCI WorldCom - Sprint would degrade interconnections fails in an obvious way. As I have mentioned earlier, the merged company could always make more profit by charging more for interconnection than by offering poor service. There is always a price level that has the equivalent harmful effect on customers as a program of degradation. The higher charge puts money in the seller's pocket immediately; degradation does not. Because, as I have concluded, the merged company would not find it profitable to raise transport charges, it follows immediately that it would suffer even more from degrading service.

84. Even if MCI WorldCom - Sprint decided to degrade interconnections rather than raise price, degrading interconnections would impose a cost on MCI WorldCom - Sprint that is comparable to the cost imposed on the rivals. In total, MCI WorldCom - Sprint customers would experience the same level of degradation in terms of the traffic sent to, or received from, the other networks as would the other networks' customers.

85. Some have argued[32] that the effects of degraded interconnections would be less severe for MCI WorldCom - Sprint than for the other networks because of MCI

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[31] See id. at ¶ 53.

[32] See id. at ¶ 53.

WorldCom - Sprint's size. In this line of argument, if traffic is isotropic,[33] a large number of Internet interactions will be within the network of the merged company, and these interactions will be unaffected by degradation of interconnection. According to this theory, the rest of the Internet networks (with the smaller total number of customers if the merged company has more than 50% of Internet customers) will suffer more than the larger network; it follows that the merged company can then attract the customers of other networks.

86. I believe that this argument is flawed. It is based on the assumption that Internet users do *not* require universal connectivity. This is plainly factually incorrect. Internet users demand to be able to reach every node of the Internet, in a similar way that telecommunications customers demand that they be able to reach anyone connected to the telecommunications network, no matter where the receiving party is located, which local exchange carrier he/she subscribes to, and who carries the long distance call.

87. Since users demand universal connectivity on the Internet, no network, however large, can afford not to offer universal connectivity. Therefore, no network would decide to degrade connections with the rest of the Internet networks unless the degrading network was certain that *all* ISPs *not* connected to it would immediately react to the degradation by instantaneously switching to the degrading network. This instantaneous switching is extremely unlikely to happen. Instead, many ISPs would reduce rather than increase use of a network that is needlessly degrading the quality of interconnections for a significant amount of Internet traffic. And, as long as there are ISPs who have not switched to the degrading network, all customers of the degrading network suffer. Each

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[33] Isotropic traffic is generated when every user initiates the same number and type of Internet interactions with every other user.

one of these customers of the degrading network is receiving connectivity significantly below his expectations of universal connectivity, and is now willing to pay less for it. Thus, the loss in value from degradation is comparable on both sides of the degraded interconnections, and can in fact be higher for the larger network. MCI WorldCom-Sprint can only harm its rivals by harming itself by just as much or more.

88. Degradation of interconnections, like termination of interconnections, sacrifices the benefits of network externalities. It would result in a loss of value in MCI WorldCom - Sprint's Internet businesses because it would limit its customers' ability to interact with the rest of the Internet. A rational business would not take this step. The merged company cannot force any of its network customers to offer inferior services to their customers by degrading the interconnection. Because there are limited switching costs and negligible barriers to expansion and entry, transport customers would switch to other networks or new entrants rather than tolerate a degraded interconnection and alienate their customers. Networks monitor the quality of service aggressively on behalf of their end users and web-site customers, and they are able to identify and react to problems that would result from deliberate degradation of interconnection.

3. Sequential Attacks On Rivals

89. Some claim that although a raising-rivals'-costs strategy is undesirable against all rivals, it would be desirable if applied sequentially to one rival at a time.[34] In this line of thought, MCI WorldCom - Sprint would degrade interconnections by targeting rivals and

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[34] *See*, Hausman Decl. at ¶ 54.

ISP customers one after the other. I explain briefly the reasons why I believe that the strategy would be self-defeating.

90. First, degrading interconnections with networks that have an alternative way to send and receive traffic through a second network connection with another network would lead to a quick response by the rivals of routing almost all of their traffic through the second network, and would therefore be undesirable to MCI WorldCom - Sprint. Figures 2 and 3 above illustrated the re-routing of traffic in response to a price increase by a large IBP. The response of competitors and clients of an IBP that degraded interconnection would be very similar to the responses of rivals and clients to a price increase by the large IBP as shown in Figures 2 and 3. Moreover a target network is likely to enter into new peering and transit arrangements with other networks that would further divert traffic from the degrading IBP. The target network could buy transit from other networks whose connectivity with the merged company's network is intact, and avoid all degradation problems. Thus, in response to degradation, traffic is routed away from the degrading IBP, and the culprit loses customers and traffic. The suggestion by Professor Hausman that the degrading network would be able to *raise* price as it *lowers* quality flies in the face of logic.

91. Second, as explained earlier, inequality in size does not imply inequality in the value of the damage sustained by two interconnecting networks as a result of a degraded interconnection. Suppose that the merged company degraded its interconnection with a much smaller network. If traffic were spread evenly across all customers (end users and web sites), the reduction in service quality experienced by each of MCI WorldCom - Sprint's customers may be smaller than the reduction in service quality experienced by

each of the smaller rival's customers. Some critics argue that this implies that ISPs connected to the targeted rival would then switch to MCI WorldCom - Sprint, and therefore the degradation strategy is "successful" in attracting customers to MCI WorldCom - Sprint.

92. The argument of the critics is based on the assumption that Internet users do *not* require universal connectivity, an assumption that is factually incorrect. Since Internet users demand universal connectivity, no network would decide to degrade a target network unless the degrading network was certain that *all* ISPs of the target network would immediately react to the degradation by instantaneously switching away from the target network. This instantaneous switching is extremely unlikely to happen. The target network is likely to establish new peering and transit relationships with other networks and utilize its multihoming arrangements to divert traffic away from the degraded interconnection and minimize the effect on its customers. After all, since the target network is the only one with degraded connectivity to the merged company's network, the target network can easily buy transit service from other networks which have full connectivity to the merged company's network and avoid all degradation problems. And, as long as there are ISPs of the target network who have not switched to the degrading network, the users of the ISPs connected to the merged company will suffer significantly as a result of the degradation. If the merged company were to degrade its interconnection to a target network, the customers of the merged company will be willing to pay less for the degraded service, and MCI WorldCom - Sprint would lose profits, even if the degradation strategy were "successful" in attracting customers to it. After all, a larger number of customers of the merged company would experience a reduced service quality

than the potential number of customers that the merged company could attract from the small target ISP.[35] Thus, the commercial impact of the serial degradation on MCI WorldCom - Sprint in terms of profit loss would be significant.

93. Third, MCI WorldCom and Sprint's customers are anything but captives. Business and individual end users and web site operators are sensitive to the quality of the service they receive. The merged company could not use its customer base as a tool for harming rivals because it would lose the customer base in the process. Customers would switch to another network in response to a reduction in service quality. A degraded interconnection reduces the quality of the service that MCI WorldCom - Sprint's customers receive, and if they could not get reliable and quick access to popular web sites served by the network rival whose connection was degraded, these customers would move to other networks whose connection with the victimized network was unimpaired. Therefore, picking rivals one by one would not reduce the damage of this strategy to MCI WorldCom - Sprint.

94. Fourth, as I have discussed earlier, a significant number of end-user service providers have connections with more than one transport provider and most large content providers have connections with a number of networks. Even if the serial killer argument were correct for traffic that went to ISPs that were exclusively connected with MCI WorldCom - Sprint, and somehow MCI WorldCom - Sprint benefited from degradation of quality to these ISPs, the degradation of quality of the MCI WorldCom - Sprint network would lead multiple connection ISPs to move traffic away from MCI WorldCom - Sprint and terminate their relationship with MCI WorldCom - Sprint.

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[35] As explained earlier, even if the merged company is "successful" in making customers leave the target network, it is likely that most of the customers leaving the target will not switch to the merged company

95. Fifth, by targeting rivals sequentially (rather than all at once), MCI WorldCom - Sprint might limit the size of the damage to itself at any point in time, but it would be just as large in total. Moreover, over a period of time, the serial degradation strategy hurts more an MCI WorldCom - Sprint customer than a customer of any targeted network.

96. If the serial degradation strategy is pursued, MCI WorldCom - Sprint customers would experience constant problems in connecting to web sites not served by the company, while each victim would face only temporary quality degradation. For example, suppose that, over a period of a year, a large network sequentially degrades interconnections for 4 months for each of 3 smaller competitors. Then customers of the larger network will experience degradation over the course of all 12 months, but customers of each of the smaller networks will not experience degradation for 8 months of the year. The continuous quality degradation experienced by customers of the larger network is at least as great as that occasionally experienced by customers of smaller (target) networks.

97. Sixth, the serial killer scenario assumes that the purchasers of Internet transport services have a passive response to the plan as it unfolds. After each victim falls, they switch their transport business to the predator, knowing perfectly well that the ultimate result will be higher prices for transport services. In fact, the rational response would be the opposite. As the plan developed, the prospective victims would take action to avoid becoming victims at all. They would seek alternative suppliers for the majority of their Internet connectivity, cutting back purchases from MCI WorldCom - Sprint to the bare minimum.

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because of the merged company's network also faces a quality degradation.

98. Seventh, the serial killer scenario is totally implausible in its implementation. Its proponents have left a number of key questions unanswered. For example, for how long will MCI WorldCom - Sprint target a network before switching to its next victim? How does MCI WorldCom - Sprint hide from its customers the increasing degradation in its service to them? How large do networks need to be to find it desirable to be serial killers? Why have we not observed this behavior at all? Suppose that the Sprint network is spun off and as a result, after the merger, the largest IBP network does not differ significantly in size from today's MCI WorldCom network. How do the proponents of the serial killer theory explain why the degradation of connectivity would happen in the future but has never happened up to now?

99. Eighth, the serial degradation strategy would be impossible to execute in practice, because new networks are coming into existence all the time. By the time that MCI WorldCom - Sprint had degraded interconnection with one network, the number of alternatives will have multiplied. In a market with negligible barriers to entry, there is no gain to eliminating one set of rivals because they will be replaced by another.

100. Ninth, I have stressed the role of customer mobility in maintaining competition in Internet transport. Larger customers already have multiple connections to the Internet and all customers can switch suppliers easily. Many ISPs have multiple connections to IBPs. Advocates of the serial killer scenario have suggested that customer mobility may contribute to the potential success of the serial killer strategy, because the customers of the targeted IBP will abandon that IBP quickly and fully.[36] This theory is incorrect because it disregards the incentives of multihoming customers and of other customers of

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[36] *See*, id at ¶ 57.

the large IBP to switch their traffic away from the large IBP in response to the degradation.

101. A multihoming ISP who is a customer of the large IBP (which initiates the connectivity degradation of the small IBP in the serial killer scenario) will also observe the degradation. Such an ISP will have an incentive to switch most of its traffic away from the two affected IBPs (large and small) to a third network. The ISP that switches traffic to a third network will now buy less transit from the large IBP. This provides incentives for the large IBP not to engage in degradation. The existence of multihoming implies that ISPs can easily reduce the amount of transit they buy from the large IBP in response to even small degradation of quality. Thus, multihoming decreases the incentive for a large IBP to degrade connectivity.

102. In conclusion, the determined serial killer only shoots himself. Serial degradation is no more likely than simultaneous degradation or price discrimination—it would lower, not raise, MCI WorldCom - Sprint's profits.

Attachment 1: CV of Nicholas Economides.

Attachment 2: Figure 1.

CURRICULUM VITAE

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A. PUBLISHED AND FORTHCOMING PAPERS IN REFEREED JOURNALS

1. "The Incentive for Non-Price Discrimination by an Input Monopolist," *International Journal of Industrial Organization*, vol. 16 (March 1998), pp. 271-284.

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